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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/726,490

12/04/2003

Zi-Ping Chen

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EXAMINER

BAUER, SCOTT ALLEN

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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/726,490	<b>Applicant(s)</b> CHEN ET AL.	
	<b>Examiner</b> SCOTT BAUER	<b>Art Unit</b> 2836	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 24 March 2009.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-3,5,16,21 and 22 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-3,5,16,21 and 22 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 04 December 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)          | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____  | 6) <input type="checkbox"/> Other: _____                          |

## DETAILED ACTION

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

1. Claims 1-3 & 5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chen (US 20010007521) in view of Lai et al. (US 2002/0089017) and Young et al. (US 5,978,192).

With regard to claim 1, Chen in Fig. 13C teaches an integrated circuit for electrostatic discharge (ESD) protection (paragraph 0008) comprising: a silicon-controlled rectifier (comprising intrinsic BJT's npn & pnp) including a transistor (46, 72 & 78) integrally formed with the SCR, the transistor including a gate (72) located over a channel between a first doped region (46) of the SCR and a second doped region (78) of the SCR; a contact pad (40) coupled to the SCR.

Chen does not teach a control circuit to change a first holding voltage of the SCR to a second holding voltage less than the power supply voltage to keep the SCR in latch-up for a time period between 150 ns and 500 ns in response to detecting an ESD

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event, and to change the second holding voltage of the SCR to a holding voltage at least to the power supply voltage to keep the SCR from latching up.

Lai, in Figure 9A, teaches an SCR used for ESD protection similar in structure to the ESD protection SCR's found in Figs. 13 A & 13C. Lai further teaches a control circuit (comprising the RC circuit (358-362) and FET 352) coupled to the silicon-controlled rectifier, wherein the control circuit changes a normal holding voltage of the SCR to a modified holding voltage less than the power supply voltage to keep the SCR in latch-up after detecting a electronic static discharge event, and changes the modified holding voltage of the SCR to the normal holding voltage which is at least to the power supply voltage after a time period to keep the SCR from latching up; and wherein the control circuit is coupled to the P doped region (308) to control the holding voltage of the SCR (paragraph 0057) .

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Chen with Lai, by coupling the control circuit of Lai to the P doped region (78) of the SCR of Chen, for the purpose of preventing the SCR from being triggered improperly and causing damage to the ESD device (Lai et al. Paragraph 0021).

If the control circuit of Lai is connected to the SCR of Chen then it would be coupled only to the SCR at the second doped region. As shown by Lai, the control circuit is coupled to the P doped region (308) this region is equivalent to the P doped region (78) found in figure 13 of Chen. As such the control circuit of Lai would only be coupled to the SCR at the second doped region.

Lai, in Fig further teaches that the rest of the control circuit is coupled to Vcc and not the pad as taught by in Fig. 9A. This further prevents the control circuit from being coupled to the SCR at any other point than the second p doped region.

Young teaches a method of clamping a voltage line to shunt and ESD event to ground. Young teaches that the ESD clamp can comprise an SCR and that the clamp can be triggered by an RC time constant that is determined by the resistor and capacitor used in an RC circuit. Young teaches that the RC time constant is typically set close to or slightly longer than 150ns (column 1 lines 49-59).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Lee in view of Lai with Young, by setting the RC time constant of Lai to be close to or slightly longer than 150 ns which is within the range of between 150ns and 300ns, for the purpose of ensuring that the protection circuit will be active for a duration sufficient to discharge the entire ESD pulse.

With regard to claims 2, 3 & 5, Chen in view of Lai discloses the device of claim 1. Young further discloses that the control circuit includes a resistor-capacitor (RC) circuit selected to provide an RC time constant corresponding to the time period between 150 ns and 500 ns (re claim 2), wherein the control circuit further comprising a resistor, a capacitor and an output terminal disposed between the resistor and the capacitor (re claim 3). Chen further teaching that the SCR further comprising a p-type substrate (42), an n-well (n-well) formed in the p-type substrate, a p-type diffused region

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(46) formed in the n-well, and an n-type diffused region (48) formed outside of the n-well.

2. Claims 16, 21 & 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lee et al. In view of Lai et al. and Young et al. as applied to claims 1, 8 & 23 above, and further in view of Tong et al. (US 6,756,834).

With regard to claim 16, Lee teaches an integrated circuit for electrostatic comprising: a contact pad (Vin); a silicon-controlled rectifier (35 & 36), the SCR associated with the contact pad, the SCR including a transistor (25, 26 & 38) integrally formed with the SCR; wherein for the SCR, a gate (38) of the transistor is coupled to the contact pad or ground.

Lee does not teach a control circuit, wherein a control circuit is coupled to the first SCR, wherein the control circuit changes a first holding voltage of the SCR to a second holding voltage less than the power supply voltage to keep the SCR in latch-up for a period between 150 ns and 500 ns in response to detecting an electrostatic discharge event, and changing the modified holding voltage of the SCR to a normal holding voltage at least up to the power supply voltage to keep the SCR from latching up or that the circuit provides a plurality of contact pads, a plurality of control circuits or that there is a plurality of SCRs.

Lai teaches an SCR used for ESD protection similar in structure to the ESD protection SCR's found in Figs. 13 A & 13C. Lai further teaches a control circuit

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coupled to the silicon-controlled rectifier, wherein the control circuit changes a normal holding voltage of the SCR to a modified holding voltage to keep the SCR in latch-up after detecting a electronic static discharge event, and changes the modified holding voltage of the SCR to the normal holding voltage after a time period to keep the SCR from latching up; and wherein the control circuit is coupled to the P doped region to control the holding voltage of the SCR.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Lee with Lai, for the purpose of avoiding latch-up while the SCR operates at normal condition, but allows for easy triggering of the device in an ESD event (Lai et al. Paragraph 0021).

Young teaches a method of clamping a voltage line to shunt and ESD event to ground. Young teaches that the ESD clamp can comprise an SCR and that the clamp can be triggered by an RC time constant that is determined by the resistor and capacitor used in an RC circuit. Young teaches that the RC time constant is typically set close to or slightly longer than 150ns (column 1 lines 49-59).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Lee in view of Lai with Young, by setting the RC time constant of Lai to be close to or slightly longer than 150 ns which is within the range of between 150ns and 300ns, for the purpose of ensuring that the protection circuit will be active for a duration sufficient to discharge the entire ESD pulse.

Tong et al., in figure 1, discloses an ESD protection circuit comprising a plurality of pads, first and second voltage sources of first and second voltage levels, and a plurality of ESD protection circuits (10 & 14). Tong et al. further teaches that each ESD protection device contains a control circuit comprising a capacitor (16) and a resistor (18).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings Lee with Tong et al. by protecting a plurality of I/O pads and voltage lines with the SCR device taught by Lee for the purpose of providing ESD protection to an entire chip assembly instead of just a single voltage source.

With regard to claims 21 & 22, Lee in view of Lai and Tong discloses the device of claim 16. Young further teaches that each of the control circuits includes a resistor-capacitor (RC) circuit selected to provide an RC time constant corresponding to the time period between 150ns and 500 ns (re claim 21), and Lee in view of Lai further teaches that the control circuit further comprising an output terminal coupled to a gate of each of the p-type and n-type transistors.

### ***Response to Arguments***

3. Applicant's arguments with respect to claims 1-3, 5, 16, 21 & 22 have been considered but are moot in view of the new ground(s) of rejection.



Applicant has amended the claims to overcome the previous non-final rejection dated 12/24/2008 to include the language that the SCR is kept in latch up for a time period between 150 ns and 500 ns. The Young reference has been cited to overcome this newly added language.

### ***Conclusion***

4. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to SCOTT BAUER whose telephone number is (571)272-5986. The examiner can normally be reached on M-F 9am-6pm.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Rexford Barnie can be reached on 571-272-7492. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

SAB  
20 JUN 09

/Robert DeBeradinis/

Primary Examiner, Art Unit 2836